COOLING APPARATUS WITH A FRONT LOADED AXIAL FLOW FAN

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to a cooling apparatus for use in a computer and, more particularly, to a cooling apparatus with a front loaded axial flow fan, which has an axial flow fan transversely located on the front side for dissipating heat from the computer efficiently.

2. Description of the Related Art:

In a computer, as shown in FIG. 1, a number of fans **20a** may be installed in the computer case **10a** to dissipate heat from the heat source inside the computer case **10a**.

Further, an information product, for example, a server or industrial computer provides a strong operation and processing functions. Consequently, it requires quick dissipation of heat. In order to dissipate heat from the computer case **10a**, the number of fans **20a** should be relatively increased. It is not expensive to install a big number of fans in the computer case of a server or industrial computer.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is the main object of the present invention

to provide a cooling apparatus for a computer, which uses a transversely extended axial flow fan to dissipate heat from the heat source inside the computer efficiently. It is another object of the present invention to provide a cooling apparatus for a computer that uses a display panel to indicate detected Fahrenheit/Celsius temperature levels.

To achieve these and other objects of the present invention, the cooling apparatus with a front loaded axial flow fan comprises a housing, the housing having a receiving open chamber extended to a front side thereof. An axial flow fan is transversely mounted in the receiving open chamber inside the housing, the axial flow fan comprising a shaft connected to drive means, and a vane wheel mounted on the shaft, the vane wheel having a plurality of vanes around the periphery thereof. A display panel is mounted on the front side of the housing, the display panel having an LED display unit. A control circuit assembly is coupled to the axial flow fan and the LED display unit, and is adapted to detect the temperature of a heat source, to compare the detected temperature level with a reference signal, to drive the axial flow fan subject to the comparison result, and to drive the LED display unit to indicate the detected temperature level.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention

will be more apparent from the following detailed description when read in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic drawing showing a plurality of fans installed in the case of a computer according to the prior art;

FIG. 2 is an exploded view of a cooling apparatus with a front loaded axial flow fan according to the present invention;

FIG. 3 is an elevational assembly view of the cooling apparatus with a front loaded axial flow fan according to the present invention;

FIG. 4 is a circuit block diagram of the present invention;

FIG. 5 is a detailed circuit diagram of the present invention;

FIG. 6 is a schematic drawing showing the operation of the present invention; and

FIG. 7 is a circuit block diagram of the microprocessor of the cooling apparatus with a front loaded axial flow fan according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 2-6, a cooling apparatus with a front loaded axial flow fan in accordance with the present invention is to be installed in the computer case **10** of a computer to dissipate heat from the computer. The cooling apparatus with a front loaded axial flow fan comprises a housing **1**, a transversely extended axial flow

fan **2**, a display panel **3**, a thin sheet type air filter **4**, a packing frame **5**, and a grille **6**.

The housing **1** has a receiving open chamber **11** extending to the front side, which accommodates a control circuit assembly (not shown). The transversely extended axial flow fan **2** is mounted in the receiving open chamber **11** inside the housing **1**, comprising a shaft **23** and a vane wheel **21** mounted on the shaft **23**. The vane wheel **21** comprises a plurality of vanes **22** around the periphery. The display panel **3** is mounted on the front wall of the housing **1** in front of the receiving open chamber **11**, comprising an LED display unit **31**, which comprises an LED 188 display and light emitting elements for °C, °F, Hi, Lo indications, a rectangular opening **32** in one side of the LED display unit **31** corresponding to the receiving open chamber **11**, and a Fahrenheit/Celsius selector switch **SW** at the bottom side of the LED display unit **31**. The thin sheet type air filter **4** is mounted within the opening **32** of the display panel **3**. The packing frame **5** is fastened to the display panel **3** to secure the thin sheet type air filter **4** in position, having an opening **51** corresponding to the opening **32** of the display panel **3**. The grille **6** is mounted within the opening **51** of the packing frame **5**.

The aforesaid control circuit assembly comprises a pulse wave reference circuit **12**, a temperature detection circuit **13**, a Fahrenheit/Celsius detection circuit **14**, a driving circuit **15**, and a

control circuit **16**. The pulse wave reference circuit **12** is a resistor **R7**. The temperature detection circuit **13** is a thermistor **WR1** adapted to detect the temperature of the heat source. The Fahrenheit/Celsius detection circuit **14** comprises the aforesaid selector switch **SW** and resistors **R9** and **R12**. The user can operate the selector switch **SW** to select Fahrenheit/Celsius as temperature units for display. The driving circuit **15** is electrically connected to the transversely extended axial flow fan **2** and adapted to drive the transversely extended axial flow fan **2**, comprised of transistors **Q1, Q3, Q4**, diodes **D1, D5**, resistors **R1, R3, R5, R8**, capacitors **C6, C16**, and an inductor **L1**. The control circuit **16** comprises a microprocessor **U1**, a transistor **Q2**, resistors **R2, R4, R62**, and a capacitor **C4**, and respectively coupled to the pulse wave reference circuit **12**, the temperature detection circuit **13**, the Fahrenheit/Celsius detection circuit **14**, the driving circuit **15**, and the LED display unit **31**.

The control circuit **16** compares the potential output from the temperature detection circuit **13** to the potential output from the pulse wave reference circuit **12**, and then provides a pulse signal to the driving circuit **15** subject to the comparison result, thereby causing the driving circuit **15** to drive the transversely extended axial flow fan **2**, or to control the LED display unit **31** to show the currently detected Fahrenheit/Celsius temperature level.

Referring to FIG. 7, the microprocessor **U1** comprises a pulse wave comparator **71**, a controller **72**, a pulse bandwidth modulator **73**, and a display control **74**. The pulse wave comparator **71** is respectively coupled to the pulse wave reference circuit **12** and the temperature detection circuit **13**, and adapted to compare the potential output from the temperature detection circuit **13** to the potential output from the pulse wave reference circuit **13**. The controller **72** is respectively coupled to the pulse wave comparator **71** and the Fahrenheit/Celsius detection circuit **14**. The pulse bandwidth modulator **73** is respectively coupled to the controller **72** and the driving circuit **15**. The display control **74** is respectively coupled to the controller **72** and the LED display unit **31**. The controller **72** receives an output signal from the pulse wave comparator **71**, and drives the pulse bandwidth modulator **73** to send a pulse signal to the driving circuit **15** subject to the output signal from the pulse wave comparator **71**, causing the driving circuit **15** to control the operation of the transversely extended axial flow fan **2**. The controller **72** also receives signal from the Fahrenheit/Celsius detection circuit **14**, and gives a signal to the display control **74** subject to the output signal from the Fahrenheit/Celsius detection circuit **14**, causing the display control **74** to drive the LED display unit **31** to display the detected current temperature level in degrees Fahrenheit or Celsius.

During operation of the computer in which the cooling apparatus of the present invention is installed, hot air is sucked from the heat source inside the computer case **10** into the air input port. When the transversely extended axial flow fan **2** sucks hot air into the inside, the air input port of the transversely extended axial flow fan **2** is in a half-open status; however, the air output port of the transversely extended axial flow fan **2** is approximately fully open. Therefore, hot air is efficiently sucked into the transversely extended axial flow fan **2** and rapidly expelled out of the computer case **10**.

As indicated above, the cooling apparatus of the present invention uses a transversely extended axial flow fan to dissipate heat from the heat source of the computer, and a display unit to indicate the current Fahrenheit/Celsius temperature in the computer, enabling the user to know the temperature status inside the computer.

A prototype of cooling apparatus with a front loaded axial flow fan been constructed with the features of FIGS. 1-7. The cooling apparatus with a front loaded axial flow fan functions smoothly to provide all of the features discussed earlier.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing

from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.